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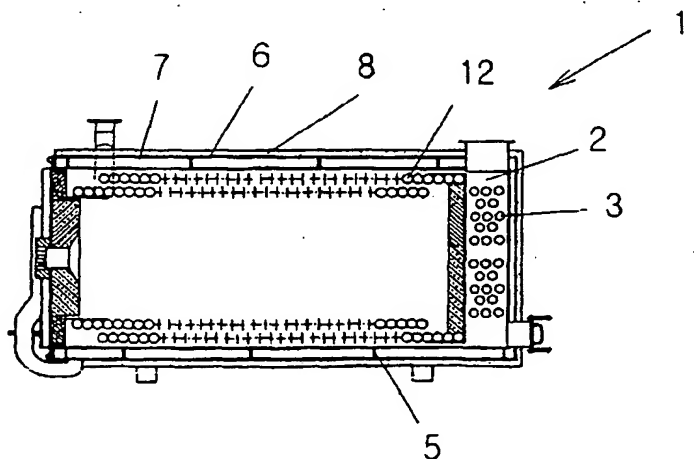
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **METHOD AND DEVICE FOR RECOVERING WASTE HEAT IN PREHEATING UNIT OF HOT OIL BOILERS**



(57) Abstract: The object of this invention is to provide a method and device for recovering waste heat in a preheating unit of hot oil boilers. The device of this invention has air feed pipes (3) transversely set in the body (1) of a boiler. Shielding rings (5), each having a cutout (4), are circumferentially mounted around the body (1) at regular intervals, with the cutouts (4) alternately positioned at the top and bottom portions of the body (1). The boiler body (1) is housed in an outer casing (6) to define a channel (7) by the rings (5) and the casing (6). The outer casing (6) is covered with an insulating cover (8). An air guide pipe extends from the outlet end of the channel (7) to a burner inside the boiler body (1), thus feeding hot air from the channel (7) to the burner and recovering waste heat.

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METHOD AND DEVICE FOR RECOVERING WASTE HEAT IN
PREHEATING UNIT OF HOT OIL BOILERS

Technical Field

5 The present invention relates generally to hot oil boilers, and more particularly, to a method and device for recovering waste heat in a preheating unit of hot oil boilers, which collects waste heat and waste combustion gas produced from the boiler and then feeds them again into the boiler for serving as combustion air required to operate the boiler, thus being capable of reusing the waste heat and
10 waste combustion gas to provide energy saving effect.

Background Art

 Generally, a hot oil boiler is designed to be provided in its body with a double-walled tube, and to be provided at a first end of its body with a burner. Special synthetic oil circulates inside the double tube having a spiral form. The
15 hot oil boiler is operated according to the following steps. That is, when the burner is ignited, air flows into the burner for starting a combustion process. Air heated by the combustion process is discharged from the boiler through the double or triple tube. At this time, smoke generated by this combustion process is discharged from the boiler to the outside through a flue chamber.

20 However, the conventional boiler has a problem that it suffers a great heat loss, because the heated air inside the boiler is undesirably discharged through the boiler body to the outside. Therefore, such a boiler causes undesirable waste of energy, thus being poor in terms of economy of operation.

 Recently, in order to solve the above problem, a method of covering the
25 boiler body with an insulating cover has been proposed to prevent heat loss by an

insulating effect of the insulating cover. But, the temperature of the combustion gas discharged from the boiler to the outside is excessively high, so the insulating cover cannot give satisfactory results.

That is, when the burner installed inside the boiler body is ignited, it heats
5 the tube containing the hot oil. In such a case, the heated air and the smoke generated by the combustion process pass through space defined between the tube and the boiler body and then are discharged through the flue chamber from the boiler to the outside.

At this time, exterior air flows into the boiler for burning oil contained in
10 the burner. The conventional burner included in such a boiler receives cold exterior air, and causes the inside of the boiler to be cooled.

As such, when igniting the burner to heat the boiler, cool air flows into the burner, thus causing undesirable heat loss. Thus, the conventional boiler has a problem that the boiler cannot be heated to a desired temperature in a short period
15 of time when it is required to operate the boiler.

Disclosure of the Invention

Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide a method and device for recovering waste heat in a preheating unit of hot
20 oil boilers, which includes a boiler body, a plurality of air feed pipes transversely set in the flue chamber of the boiler body, a plurality of shielding rings having cutouts and circumferentially mounted around the boiler body such that the cutouts are alternately positioned at the top and bottom portions of the body, and an outer casing housing the boiler body to define an air channel by the rings and the casing,
25 thus being capable of heating air flowing along the air channel using waste heat from the boiler body and then feeding the heated air into the burner inside the boiler body, therefore being capable of preventing undesirable energy loss.

Brief Description of the Drawings

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

5 Fig. 1 is a perspective view showing a hot oil boiler according to the present invention;

 Fig. 2 is a vertical sectional view of the hot oil boiler of this invention;

 Fig. 3 is a side sectional view of shielding rings, each having a cutout, included in the hot oil boiler of this invention, with a heat insulating cover being not
10 shown;

 Fig. 4 is a detailed side sectional view showing an air channel formed by the shielding rings mounted on the boiler body of this invention;

 Fig. 5 is a side sectional view of a flue chamber included in the hot oil boiler of this invention; and

15 Fig. 6 is a front view of a hot oil boiler according to another embodiment of this invention.

Best Mode for Carrying Out the Invention

Reference now should be made to the drawings, in which the same reference numerals are used throughout the different drawings to designate the same
20 or similar components.

 The method of this invention of recovering waste heat in a preheating unit of hot oil boilers, having a boiler body provided with a double-walled or triple-walled boiler tube, a burner installed in the first end of the boiler body, and a flue chamber installed in the second end of the boiler body, and an insulating cover
25 covering the boiler body, includes the steps of: heating air using waste heat from the

boiler body while the air, fed through air feed pipes transversely set in the boiler body in such a way as to pass through the flue chamber of the body, flows along an air channel defined outside the body; and feeding the heated air to the burner inside the boiler body.

5 The device for recovering waste heat in a preheating unit of hot oil boilers according to this invention includes a boiler body 1, a plurality of air feed pipes 3, a plurality of shielding rings 5, an outer casing 6, and an air guide pipe. The air feed pipes 3 are transversely set in the flue chamber 2 of the boiler body 1. The shielding rings 5 have cutouts 4 and are circumferentially mounted around the
10 boiler body 1 at regular intervals such that the cutouts 4 are alternately positioned at the top and bottom portions of the body 1. The outer casing 6 houses the boiler body 1 to define an air channel 7 by the rings 5 and the casing 6, and is covered with an insulating cover 8 for heat insulation. The air guide pipe extends from the outlet end of the channel 7 to a burner inside the boiler body so as to feed hot air
15 from the channel 7 to the burner. Reference numeral 12 denotes a boiler tube, and will not be described in detail herein.

It may be preferable that the shielding rings 9 be formed in a single spiral ring circumferentially mounted around the boiler body 1, and the outer casing 10 house the body 1 to define the air channel 11 by the spiral ring 9 and the casing 10.

20 The operation of the hot oil boiler according to this invention is as follows.

A burner, installed inside the boiler body 1, is ignited by turning on the boiler, thus generating hot air. The hot air and combustion smoke from the burner heats an outer double tube installed inside the boiler and then passes through the gap defined between the tube and the body 1. Next, the hot air and combustion
25 smoke flow into a flue chamber 2 of the boiler body 1 and then are discharged from the boiler to the outside through the flue chamber 2.

At this time, waste heat is discharged to the outside through the flue chamber 2 while heating a plurality of air feed pipes 3 which are formed in multi layers and transversely set in the flue chamber 2 of the boiler body 1.

While air is fed through the air feed pipes 3 from the outside, air is primarily heated by the waste heat in the flue chamber 2 and then flows along a channel 7 defined outside the boiler body 1.

5 In this case, when the boiler body 1 is heated by the burner, air is used to heat the air feed pipes 3 along with the remaining waste heat and simultaneously flows along the channel 7 defined between the boiler body 1 and the outer casing 6 toward the outlet end of the channel 7, thus continuously heating the boiler.

10 Since the channel 7 is defined between the boiler body 1 and the outer casing 6 by the shielding rings 5 which have the cutouts 4 and are circumferentially mounted around the boiler body 1 at regular intervals, air can flow along the channel 7 while passing through the cutouts 4 of the shielding rings 5.

15 As described above, the shielding rings 5 each have a cutout 4 and are circumferentially mounted around the boiler body 1. In this case, the cutouts 4 are alternately positioned at the top and bottom portions of the body 1, so air moves up and down along the body 1 to uniformly heat the body 1, thus being capable of keeping temperature of the boiler uniform.

Since air heated in this way is fed into the burner installed inside the boiler body 1, subsequent to the ignition of the burner, the air is fed again into the boiler and reused to heat the boiler tube.

20 The outer casing 6 is covered with the insulating cover 8 so that the channel 7 through which air flows is kept warm, thus saving energy due to minimized heat loss.

25 Preferably, the air guide pipe extending from the outlet end of the channel may be connected to an external pipe arrangement of a heating system in place of the burner. In addition, it is also preferable to install hot water pipes in the flue chamber, in place of the air feed pipes. Such an arrangement effectively recovers waste heat from the boiler.

In Fig. 6 showing another embodiment of this invention, the shielding rings 9 are formed in a single spiral ring circumferentially mounted around the boiler

body 1, so air fed from the air feed pipes 3 flows along the spiral channel 11 while being heated by waste heat dissipated from the boiler body 1. The air heated in this way is fed into the burner, thus accomplishing the same effect as that of the above embodiment.

5 Industrial Applicability

As described above, the present invention provides a method and device for recovering waste heat in a preheating unit of hot oil boilers, which includes a boiler body, a plurality of air feed pipes transversely set in the flue chamber of the boiler body, a plurality of shielding rings having cutouts and circumferentially mounted
10 around the boiler body such that the cutouts are alternately positioned at the top and bottom portions of the body, and an outer casing housing the boiler body to define an air channel by the rings and the casing, thus being capable of heating air flowing along the air channel using waste heat from the boiler body and then feeding the heated air into the burner inside the boiler body. The device of this invention is
15 easy to manufacture due to its simple construction. This device is also capable of avoiding undesirable energy loss due to recycling of waste heat, accomplishes maximum heat efficiency, and avoids undesirable waste of fuel, as well as reducing operating expenses.

Although the preferred embodiments of the present invention have been
20 disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

1. A method of recovering waste heat in a preheating unit of hot oil boilers having a boiler body provided with a double or triple boiler tube, a burner installed in a first end of the boiler body, and a flue chamber installed in a second end of the boiler body; and an insulating cover covering the boiler body, comprising the steps of:

heating air using waste heat from the boiler body while the air, fed through air feed pipes transversely set in the boiler body in such a way as to pass through the flue chamber of the body, flows along an air channel defined outside the body; and feeding the heated air to the burner inside the boiler body.

2. A device for recovering waste heat in a preheating unit of hot oil boilers, comprising:

a boiler body;
a plurality of air feed pipes transversely set in a flue chamber of the boiler body;

a plurality of shielding rings, each having a cutout and circumferentially mounted around the boiler body at regular intervals, with the cutouts alternately positioned at the top and bottom portions of the body;

an outer casing housing the boiler body to define an air channel by the rings and the casing, and covered with an insulating cover for heat insulation; and

an air guide pipe extending from the outlet end of said channel to a burner inside the boiler body, thus feeding hot air from the channel to the burner.

3. The device for recovering waste heat according to claim 2, wherein said air feed pipes are transversely set in the boiler body in such a way as to pass through the flue chamber of said body.

4. The device for recovering waste heat according to claim 2, wherein said shielding rings are circumferentially mounted around the boiler body at regular intervals such that the cutouts of the rings are alternately positioned at the top and bottom portions of the body, and said outer casing houses the boiler body to define the air channel by the rings and the casing.

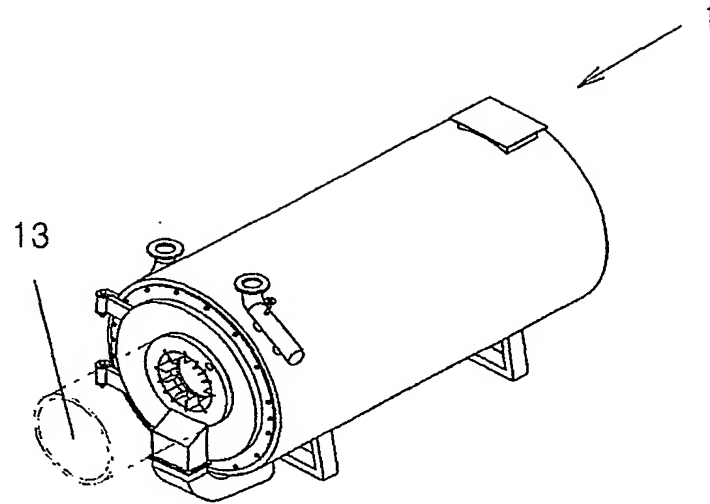
5. The device for recovering waste heat according to claim 2 or 4, wherein said shielding rings are formed in a single spiral ring circumferentially mounted around the boiler body, and said outer casing houses the body to define the air channel by the spiral ring and the casing.

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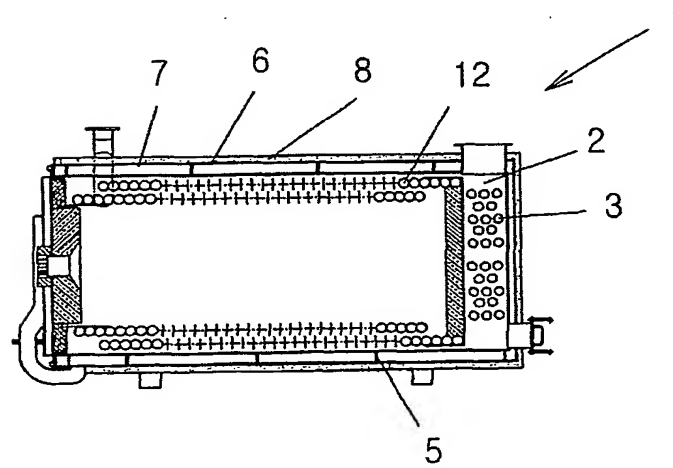
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【Fig.1】

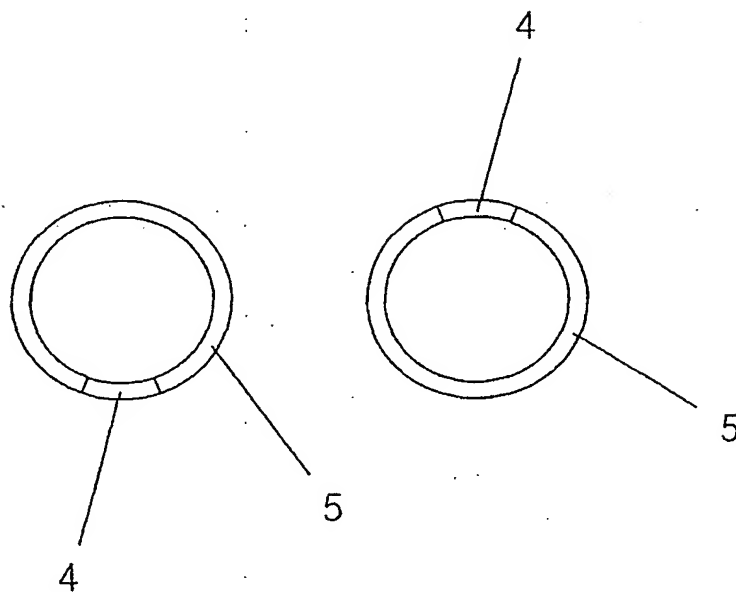


【Fig.2】

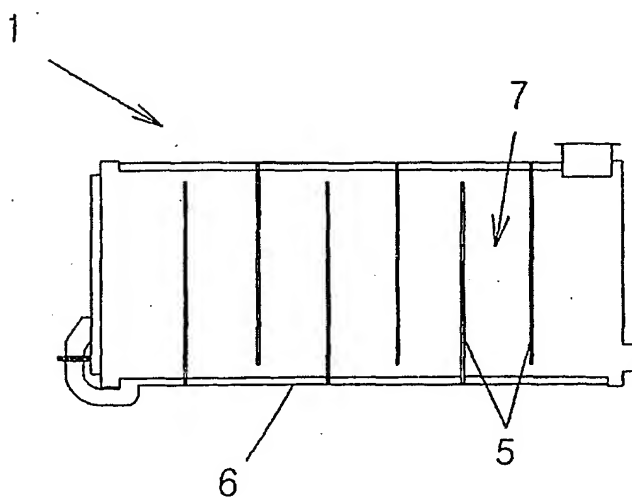


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【Fig.3】

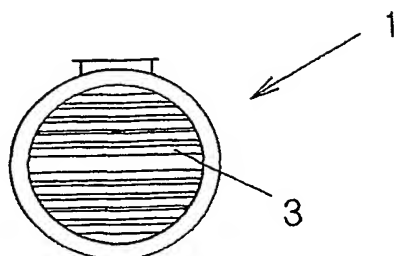


【Fig.4】

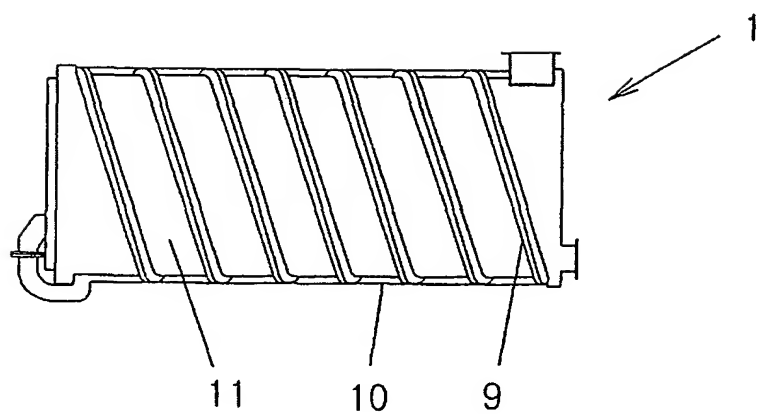


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【Fig.5】



【Fig.6】



INTERNATIONAL SEARCH REPORT

international application No.

PCT/KR01/01744

A. CLASSIFICATION OF SUBJECT MATTER**IPC7 F22B 33/00**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 F22B, F24H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

KR, JP:IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 93-18498 U (Hwang, Byeng Kyu) 21 August 1993 See the whole document	1,2,3,4
Y	KR 1999-0069256 A (Kim, Su Young)) 6 September 1999 See the whole document	1,2,3,4
A	US 4987881 (Rajendra K. Narang) 16 March 1990 See column 4 line 38- column 4 line 54; Figure1, Figure1B, Figure1D	1
A	US 4558689 (Artie McCann) 25 June 1984 See column 2 line 3 - column 3 line 8	1

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR01/01744

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4,558,689 A1	17-12-85	None	
US 4,987,881 A1	29-01-91	None	
KR 93-18498 U	21-08-93	None	
KR 99-0069256 A	06-09-99	None	